APPENDIX

Detailed Methods Used for the Lower Limb Model

A lower limb, comprising three rigid bodies (femur, tibia, foot) interconnected by three torsional springs (representing the elastic resistance of the soft tissues of the hip, knee, ankle) in series, was modeled in Adams (MSC Software, Newport, CA, USA) to better interpret the *in vitro* data. The lower limb model was designed to model the intersegmental transfer of axial momentum occurring during pivot landings. The proximal end of the "femur" rigid body was attached to a fixed pelvic point by means of a torsional spring (k_{Hip}), meanwhile the distal end of the "foot" rigid body was free (Figure 5A). The "tibia" rigid body was attached to the "femur" and "foot" bodies by means of torsional springs (k_{Knee} and k_{Ankle}, Figure 5A).

The mass and moments of inertia of the "femur", "tibia" and "foot" were obtained from Enoka.[9] Segmental mass was based on a total body mass of 73 kg. The rotational stiffnesses used for the springs (k_{Knee} and k_{Ankle}, Figure 5A) representing the knee and ankle were obtained from Schmitz and Shultz.[36] The normalized stiffnesses were converted to absolute values using a body mass of 73 kg and a height of 1.74 m. These values for body mass and height were selected based on the average size of the men from which the segmental data were calculated.[9] All model parameters are presented in Table A1.

A torque of 10 N·m was applied, peaking at 80 ms, about the longitudinal axis of the foot to create angular momentum. Stiffness of the spring representing the hip (k_{Hip}, Figure 5A) was systematically increased from 0.9 N·m/deg to 9.4 N·m/deg in 0.6-N·m/deg increments, in separate trials. This range of stiffness was selected to replicate the range of femoral rotation found in our experimental data. For each hip stiffness, femoral rotation and tibial rotation and torque (relative to the femur) rotation were calculated.

Table A1. Lower limb model parameters.

Parameter	Value
Hip Torsional Spring	
k_{Hip} (N·m/deg)	0.9 – 9.4
preload (N)	0
Femur Rigid Body	
mass (kg)	10.3
I_{xx} (kg·m^2)	0.1995
I_{yy} (kg·m^2)	0.1995
I_{zz} (kg·m^2)	0.1000
Knee Torsional Spring	
k_{Knee} (N·m/deg)	1.246
preload (N)	0
Tibia Rigid Body	
mass (kg)	3.2
I_{xx} (kg·m^2)	0.0369
I_{yy} (kg·m^2)	0.0387
I_{zz} (kg·m^2)	0.0063
Ankle Torsional Spring	
k_{Ankle} (N·m/deg)	2.491
preload (N)	0
Foot Rigid Body	
mass (kg)	1.0
I_{xx} (kg·m^2)	0.0040
I_{yy} (kg·m^2)	0.0044
I_{zz} (kg·m^2)	0.0010

k: spring stiffness; I: moment of inertia;
xx: medial-lateral axis; yy: anterior-posterior axis; zz: longitudinal axis; k: torsional stiffness